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Teaching Mathematics Thematically: Teachers' Perspectives

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Teaching mathematics through themes has been praised for relating mathematics to real-life situations. However, research shows that the implementation of teaching mathematics thematically has not been widely adopted. In the present study, instructional, curricula and organisational factors that teachers perceive as obstacles to the implementation of a thematic approach to teaching mathematics were explored. Findings from interviews with 10 secondary mathematics teachers who were implementing a curriculum requiring a thematic instructional approach are reported. The findings of the study extend the literature concerning teachers' beliefs and practices in the teaching of mathematics, and broaden understandings of the issues surrounding the implementation of a thematically taught mathematics curriculum.

A thematic approach to teaching mathematics is said to benefit students because it has the power to capitalise on students' real-world knowledge and experiences and enhance cognitive and affective outcomes (Freeman & Sokoloff, 1995; Wubbels, Korthagen, & Broekman, 1997).

Teaching mathematics thematically emphasises the use of applications of mathematics around a central theme whereas teaching in topics predominantly emphasises mathematical content. For example, if the central theme is sports, the thematic unit would be organised in different content areas such as percentages, measurement, statistics or algebra, and in all these areas sport-related applications of mathematics will be emphasised. Teaching in themes is said to facilitate experiential and situated learning, and bring personal meaning and direction to the learning process (Handal, Bobis, & Grimison, 2001). Seely (1995) states that in thematic teaching:

> No longer are concepts and facts presented in an isolated, decontextualized manner with little relevance to the lives of the students. Rather, there is an emphasis on meaning making, problem solving and discovery. Students are active participants in the classroom, constructing and building connections between ideas and concepts they already know and new ideas and concepts they are being introduced to. (p. 2)

This approach to teaching mathematics has existed in various manifestations around the world for a number of decades, either optionally or compulsorily (e.g., Handal, 2002; Secondary Schools Board NSW, 1983). However, some overseas research reveals that there is no substantial evidence of its widespread acceptance and use by teachers in schools (Burkhardt, 1984, 1987, 1989, 1994; Handal, 2000; Kupari, 1989; Wubbels et al., 1997). In fact, research on thematically based curricula shows that teachers tend to hold on

to traditional teaching practices and pay little attention to the use of real-life applications in class (Kupari, 1989). Short and Burke (1996) suggest that teaching thematically requires a change of beliefs in the way teachers look at the curriculum, students, and teaching and learning.

In this article the results from the interview component of a larger study designed to explore secondary mathematics teachers' beliefs about the teaching and learning of mathematics thematically are reported (Handal et al., 2001). In particular, factors highlighted by teachers as affecting their implementation of mandatory requirements to teach thematically are explored. For an in-depth discussion on the factors influencing teachers' instructional styles in teaching thematically see Handal and Bobis (2003).

The findings of this study extend the knowledge-base concerning teachers' beliefs and practices towards teaching mathematics. More specifically, understanding of a range of issues contributing to the implementation of mathematics via thematic instruction is furthered and guidance is provided for the development of professional development of teachers in this area.

Teaching Mathematics Thematically

The term *thematic instruction* applies to *teaching mathematics thematically and teaching in themes*. Generally, teaching mathematics thematically emphasises the use of applications of mathematics around a central theme whereas teaching in topics normally emphasises mathematical content. The teaching of mathematics thematically is considered as belonging to the realm of situated learning because content is embedded in themes that, in turn, serve as learning contexts (Henderson & Landesman, 1995). Situated learning is primarily concerned with the need to contextualise instruction since, by definition, all learning is situated. Learning is seen not as a matter of ingesting pre-existent knowledge but as a way of developing knowledge in meaningful and practice-bounded contexts (Putnam & Borko, 2000; Streibel, 1995). In turn, this situated perspective is associated with constructivist ideas of learning mathematics due to their shared premise for building mathematical knowledge within those contexts (Anderson, Reder, & Simon, 1996; Seely, 1995). The thematic approach is also directly associated with constructivist ideas since it provides an environment where knowledge can be individually and socially constructed (Freeman & Sokoloff, 1995; Seely, 1995). In general, teaching via themes is considered to facilitate learning because it brings personal meaning and direction to the learning process. Hence, teaching mathematics thematically is desirable because it can potentially narrow the gap between *school mathematics and out-of-school mathematics*.

Thematic instruction in mathematics is an umbrella term for a wide range of educational experiences that relate mathematics to real life situations (Handal, 2001). In those experiences, the real world serves as a representation of a mathematical concept or technique. This representation

constitutes a movement from the concrete, "the every day world of things, problems, and applications of mathematics", to the abstract world, "mathematics symbols, operations and techniques", or vice versa (Schroeder & Lester, 1989, p. 33). Some textbooks associate thematic instruction with the use of disconnected applications of mathematics as a means to exemplify and reinforce a previously taught mathematical concept (Handal, 2001). At that simplistic level, the thematic learning context is fragmentary since these applications of mathematics, within a learning unit or a lesson, are disconnected and not related to each other. Consequently, applications of mathematics are not presented as a single central theme but under multiple smaller themes. For example, after a teacher has explained the definition of percentages and the computational procedure to find the percentage of a given quantity, students are exposed to real-life problems in which percentages are to be calculated. However, in this form of teaching mathematics thematically, the contexts of these problems are not connected to each other. In some applications percentages involving mass would be emphasised, while the next percentage problems would comprise a different context, say, money or length.

In a more sophisticated form, thematic instruction may be organised around central generative ideas or themes. If the central theme is sports, for example, the thematic unit would be organised in different content areas such as percentages, measurement, statistics or algebra, and in all these areas sport-related applications of mathematics would normally be emphasised.

Guidelines on how to proceed with thematic teaching in mathematics are general and, at times, vague. In short, guidelines suggest more use of co-operative learning, concrete materials, class discussion, guided discovery (Henderson & Landesman, 1995), formulating and solving problems, data gathering, practical work, fieldwork, and use of technology (Abrantes, 1993). The lack of explicit guidelines increases the difficulty faced by teachers when trying to implement mandated courses requiring a thematic approach. Added to this is the fact that studies dealing with teaching and learning mathematics thematically are few. Most of the literature comes from other discipline areas such as reading comprehension (Black & Power, 1980; Jose, 1988) and curriculum integration (Lipson, Valencia, Wixson, & Peters, 1993). Studies dealing with the applications of mathematics have strong theoretical ties to teaching and learning mathematics thematically and, given the dearth of literature in the area, are often used as a substitute theoretical framework (Usiskin, 1991).

The Effect on Attitudes and Achievement

Unfortunately, empirical studies are not clear as to whether teaching mathematics thematically has a positive effect on students' attitudes towards mathematics or on their mathematical achievement. The problem does not simply lie in a lack of available research. Problems with the research designs of these studies also exist. In many, there is insufficient explanation of the

materials and the diverse methodologies used or the *type* of thematic approach used (e.g., Abrantes, 1991; Julie, 1983). Additionally, results on the effects of teaching mathematics thematically are inconsistent or inconclusive. For example, Abrantes (1991), Julie (1983) and Kaiser-Messmer (1989) reported improved student attitudes, although the findings mainly come from anecdotal reports and interviews and therefore the strength of the improvements have not been quantitatively measured. However, they noted students' attitudes towards mathematics declined in the long term. They suggested that students' attitudes were more related to their own interests and to the specific theme of the learning material. Henderson and Landesman (1995) found no positive effects of thematically integrated mathematics instruction on attitudes towards mathematics of 103 students of Mexican descent, but reported positive effects on their mathematical achievement. Later, Henderson and St. John (1997) reported mixed results in mathematical achievement in a project using a thematic curriculum for seventh and eighth graders. Verschaffel and De Corte (1997), however, found significant differences in students' motivation as a result of a program based on realistic mathematical modelling.

There is some evidence to support the claim that teaching mathematics thematically results in academic advancement. Pepple and O'Connor (1992) reported gains in academic achievement in the evaluation of a curriculum based on teaching mathematics thematically among 559 secondary students in 16 urban and rural schools. However, McKernan (1994) after 27 weeks of thematic instruction to second grade children, found no significant differences between control and treatment groups.

Hence, claims concerning the benefits of using a thematic instructional approach in mathematics are far from being verified. The successful implementation of the approach is hampered by not only a lack of research in the area, but of inconsistent findings regarding its impact on attitudes and achievement levels and the lack of clear instructional guidelines for teachers. Further research is undoubtedly needed in this area.

Identifying Barriers to Teaching Mathematics Thematically

Despite the paucity of research surrounding thematic instruction in mathematics, there is sufficient evidence indicating that the implementation of mathematics curricula based on a thematic approach faces a number of obstacles. Many of these obstacles were identified in the questionnaire component of the current research project and have been reported elsewhere (Handal, 2000; Handal et al., 2001). These obstacles can be grouped following Memon's (1997) classification of factors affecting curriculum change in mathematics education, namely: instructional, organisational, and curricular factors.

Instructional factors cover a broad range of pedagogical difficulties in regard to teaching and learning mathematics. Instructional factors include issues related to students' abilities in literacy and numeracy, as well as their

motivation to learn and their attitudes towards learning mathematics. Teachers' beliefs about the effectiveness of thematic instruction as compared to other approaches is also a significant instructional factor influencing implementation. In addition, some teachers may be doubtful of the *authenticity* of real-life problems in ordinary school textbooks. Other instructional factors include assessment and reporting strategies, as well as the use of technology in the classroom.

Organisational factors include logistic difficulties in preparing lessons for teaching, such as the availability of technology and the suitability of textbooks, and teachers' concerns about professional development in teaching mathematics thematically.

Curricular factors involve the place of teaching mathematics thematically within the constraints of state-wide external examinations, the ease of programming to meet mandated learning outcomes from the relevant mathematics syllabus, and the continuity of the course with the rest of the school mathematics curriculum.

Aim and Context of the Study

As mentioned earlier, the research reported here was part of a larger study designed to explore secondary mathematics teachers' beliefs and practices about the teaching and learning of mathematics thematically (Handal, 2001). In the first phase, a questionnaire was devised to identify teachers' beliefs and practices in regard to teaching mathematics thematically. The findings from this phase suggested that a number of factors hinder the implementation of a curriculum based on teaching and learning thematically (Handal et al., 2001). In the interview phase reported here, the aim was to investigate, through detailed interviews, these and other factors identified by respondents to the questionnaire, thus providing further insight into the barriers and challenges teachers face teaching mathematics, and in particular, teaching mathematics thematically (see Appendix for sample questions from the questionnaire and the interview guide). The instructional, curricular and organisational classification of factors (Memon, 1997) outlined above, provided a useful framework for analysing the issues identified.

The context for the study was the Year 9 and 10 Mathematics Standard course being implemented in all public secondary schools in New South Wales (NSW), Australia (Board of Studies, NSW, 1996). The main feature of this course is the mandatory requirement to utilise a thematic instructional approach. While the focus of the study was on teachers implementing this particular course, the findings also deal with broader issues relating to the teaching of mathematics thematically.

Methodology

The purpose of the interview component of the study was to explore in greater detail teachers' responses to the questionnaire component of the study. More importantly, the intention of the interview component was to

capture teachers' perceptions of the instructional, curricular and organisational problems that affected the implementation of the teaching of mathematics thematically in the Standard course. It was thought that these factors were the reasons why teachers were not fully translating their beliefs, as revealed in the questionnaire component of the study, into practice. For this reason, semi-structured interviews were conducted because it was considered that this would allow a more detailed examination of people's perceptions on a broad range of issues (Brown & Rose, 1995; Minichiello, Aroni, Timewell, & Alexander, 1990).

Participants

Fifteen teachers indicated on their questionnaires their willingness to participate in the follow-up interview component of the study. Ten teachers from the Sydney Metropolitan area were selected on the basis of obtaining, as much as possible, an equal representation of five independent variables: gender, faculty position, years of teaching experience, academic qualifications, and socio-economic status of the school. The respondents selected for the sample can be said to represent the diversity of interests and opinions of the participants in the questionnaire component of the study. The sample represented teachers from six of the seven school districts involved in the study. All the interviewees taught the Standard course (mandated to be taught using a thematic approach).

Procedure and Data Analysis

A guide was prepared to lead the semi-structured interviews. The interview schedule itself was an instrument designed to organise responses into the initial categories of analysis: instructional, curricular, and organisational issues affecting the teaching of mathematics thematically (Memon, 1997). These issues emerged from the questionnaire component of the study and from a review of the literature. The interviews were audio-taped, transcribed and coded. Each interview took approximately 40 minutes.

Teachers' responses were broken into sub-themes. A sub-theme represented a single meaningful and complete idea expressed by a respondent. Sub-themes were coded into the initial categories of analysis, although some sub-themes were coded in several categories. As new sub-themes were coded, additional categories began to emerge. Simultaneous sub-themes within each category were reduced on the basis of common attributes to discover any underlying uniformity across the data. In the course of this process, some categories collapsed to give way to broader generalisations until further comparison could not be made because of saturation. When no common themes were identified for each category, the analysis focused on the nature, significance and recurrence of these more isolated opinions. This methodology is similar to those used by other researchers to interpret teachers' opinions on a variety of educational issues and contexts through interviews (Brown & Rose, 1995; Foss & Kleeinsasser, 1996; Minichiello et al., 1990).

Results and Discussion

Interviewees spoke about their perceptions of the advantages and disadvantages of teaching mathematics thematically. They were unanimous in supporting the humanistic goals of thematic instruction because they felt that teaching in themes had the power of showing students the usefulness of school mathematics. However, responses indicated that, generally, teachers were struggling to implement a thematic approach for a variety of reasons. These reasons are presented and discussed below under the major headings of instructional, curricular and organisational factors.

Instructional Factors

A number of the instructional issues that emerged were related to the nature of the students undertaking the Standard course-their academic abilities in mathematics and literacy, and their attitudes toward mathematics and its implications on their motivation to learn mathematics. For instance, most teachers expressed the belief that a procedural instruction approach based on rules and formulae was the most suitable one for the mathematical abilities of students typically undertaking the Standard course. These students usually had a long record of poor performance in mathematics. Furthermore, there was the belief that procedural-type mathematics instruction *settles* the students in class and they were thus easier to teach.

The poor attitude and lack of motivation of students to learn mathematics using a thematic approach was another challenge reported by teachers. An interviewee mentioned that if the theme did not interest the students they would *switch-off* and then it would be difficult to recover their attention in class. According to most teachers, although teaching thematically was meant to be encouraging and inviting to students, their interest was difficult to sustain because Standard students were perceived to have never been successful academically in mathematics and had short concentration spans which sometimes "leads to misbehaviour and boredom". According to one teacher, many of the students did not have enough social skills to cope with "hands-on" activities. This teacher believed that most students, particularly the less mathematically able ones, reacted more favourably to repetitive drill as this strategy gave them a sense of accomplishment in the short term. Another teacher commented that her students liked learning mathematics in topics better than in themes because "it is something different for them". Another teacher believed that the diversity of prerequisite skills to be taught before the theme was introduced was a source of discouragement for the students. This delay caused them to be *off-task* even when the theme itself sounded interesting and relevant for their lives. The same teacher also considered that the motivational problem of his students existed regardless of whether they were taught through topics or themes.

Another challenge facing teachers that emerged from the interviews was students' low literacy levels and their inability to cope with the amount of

reading required in thematic mathematics. Most teachers agreed that their students were struggling with the course because of their generally poor literacy skills and the high literacy demands of the course given that it is predominantly based on word problems. Reading comprehension problems were noted among students from non-English-speaking backgrounds in particular. A number of teachers found themselves very often translating the texts for the students. Some faculties mentioned that they had formally incorporated a literacy component into their lessons to gradually overcome this limitation.

Some teachers perceived parents as preferring instruction based on topics rather than themes. A head teacher mentioned that on a number of occasions parents contacted the school because they were concerned about the absence of formal tests to assess students' progress in the mathematics course. Another teacher remarked that she had a few parents wanting to examine the syllabus because they could not believe that their children were learning in a style that was so unfamiliar to them.

In addition, interviewees confirmed that their colleagues were more willing to teach by topics than themes. One teacher, for example, worked in a faculty that taught the total course via topics to the extent that even the textbooks that they followed were predominantly organised according to topics. Opinions varied on whether teachers felt pressured to teach either according to topics or thematically by their head teachers. One teacher mentioned that her faculty head "leaves it up to us" whether to teach via topics or thematically. In other faculties, it seemed that teachers were caught in the dilemma of being expected to teach via themes whilst preferring to teach via topics. One head teacher declared a personal dislike of teaching mathematics thematically: "I just don't think we're getting the best out of the students by teaching in themes, and that's what we are addressing at the school at the moment…".

Another disadvantage expressed by the majority of the interviewees related to the loss of structure in teaching thematically. Most teachers believed teaching mathematics thematically was too fragmentary, repetitive and lacked continuity when it came to teaching basic skills. It was considered too fragmentary because "you will have to do bits and pieces in each theme" and because there is little sequential development of the mathematical notions. Teaching mathematics thematically was also considered "too repetitive" because in each lesson students repeatedly worked through basic content areas such as percentages, areas, approximation and the like. A teacher mentioned that his students on occasions had reacted to this repetition by saying "haven't we done this before?" Another teacher mentioned that very often a topic is taught once and then again several weeks later, thus skipping small but basic concepts in between. One teacher indicated that there were too many disparate concepts under the same theme and that this was very unsettling for the students. She commented that teaching mathematics thematically was too "wishy-washy" and students

perceived it as being "all over the place". Another spoke of her struggles to focus the first 20 minutes of the lesson teaching a variety of prerequisite skills before conducting the thematic component of the lesson.

Curricular factors

An examination of teachers' beliefs regarding curricular factors affecting the teaching of thematic mathematics revealed a conflict between the present neo-behaviourist orientated educational context in which the Standard course is currently operating and the constructivist nature of the course itself. It has been argued elsewhere that the neo-behaviourist nature of the current educational system is a reflection of the introduction of outcomes based education ideas in the educational arena, with its emphasis on outcomes, frameworks, benchmarks, indicators, descriptors, teaching accountability, curriculum frameworks and the like (Clements, 1995; Dengate, 2000; Mock, 1999). Interviewees' responses suggest that many teachers perceive a contradiction between the constructivist goals of the Standard course and the neo-behaviourist tendency of the current educational milieu.

There was general agreement among teachers interviewed that course performance descriptors do not match the Standard course outcomes as they apply to the thematic units and teachers expressed their confusion as to how to manipulate performance descriptors. Course performance descriptors are a set of observed achievement standards that are used to assign the school-based assessment grade for the School Certificate. Mock (1999) has raised concerns about the behaviourist orientation associated with course performance descriptors and Pegg (1998) has stated that course performance descriptors need to undergo further development to appropriately match students' cognitive outcomes. For two head teachers the major reason for this impasse is that the Standard course performance descriptors were not written for themes and therefore there is no way to match the descriptors with what was required in the course. Another head teacher mentioned that his faculty had great difficulty in organizing the students' progress reports because they had to discuss whether the outcomes on the reports matched any of the six areas of the course performance descriptors (e.g., working mathematically, geometry, number, measurement, chance and data, and algebra). This head teacher said that it was too difficult to make sufficient meaning of the outcomes in terms of the theme. He also said that it would have been better to have mathematics outcomes more clearly defined within each thematic unit so that these outcomes "plug and consolidate more explicitly with the course outcomes".

Most teachers were of the opinion that the Standard course outcomes did not match the common School Certificate Test content because the thematic approach is not considered in those tests. In NSW, before 1998, there were three distinct Schools Certificate Tests for the Advanced, Intermediate and General (Standard) courses. The new School Certificate, however,

established a single test for the three courses. In the interviews, teachers disagreed with the idea of having a common School Certificate Test since Standard students were measured by the same scale as the Advanced and Intermediate students. The School Certificate Test is also said to be too difficult for Standard students (Beechey, Bigelow, & Whitland, 2001; Dawe, Dengate, Howard, & Perry, 1999; Jamal, 1998). Most teachers perceived that Standard students were being discriminated against and had little chance of success. In one teacher's words "it makes them feel really dumb because they know it [the School Certificate Test] is hard". One teacher was of the opinion that past common School Certificate Tests did not match the thematic approach because they consisted of just basic skills with their mathematical applications. One head teacher said that the School Certificate Test had been designed for Intermediate and Advanced students because it had not been written thematically. According to her, in the School Certificate test "there aren't questions that are in themes or based on what they're doing". Another teacher said: "Intermediate and Advanced don't have themes and so they're two courses as opposed to the Standard [that] is only one course".

Most teachers reported assessing students' achievement through tests that included both mathematical concepts and isolated applications of these concepts. Most faculties felt that reporting should occur this way because it made more sense when they had to report outcomes based on course performance descriptors. In one head teacher's words:

> The reporting system here wouldn't be conducive to themes. It's not in themes. It's in mathematical ability. So when you're reporting, I've not heard or know of anybody that would report back in themes. It doesn't allow us to report back in themes. The Standard course descriptors aren't written in themes. So we can't report in themes when our course performance descriptors are not in themes.

Interviewees were also of the opinion that the length of the core of the Standard course did not pose a problem and that sometimes they finished the course earlier. Some faculties mentioned that instead of doing the optional themes and topics of the Standard course, they preferred to spend that time revising for the School Certificate Test. One teacher mentioned going through the optional topic *Further Algebra*. However, there was consensus among interviewees that the depth of mathematical treatment was too shallow. According to the respondents the course content paralleled in many respects what was learnt in Stage 4 (Grades 7 and 8), except that the themes made instruction more repetitive and gave students a purpose for learning mathematics.

Organisational Factors

Logistical factors also appear to impose great demands on teachers in the teaching of thematic mathematics. There has been little professional development for teaching mathematics thematically. If teaching thematically requires complex and innovative pedagogical skills as it appears in this

study, the provision of professional development and networking is vital to the success of using a thematic approach (Stephen & Varble, 1995).

In terms of resources, interviewees agreed that in order to align with the thematic approach they needed to spend more time and effort in locating, adapting and producing materials not only suitable to the theme but also to the capabilities of low-ability students in mathematics. Only three faculties reported developing and photocopying their own resources rather than relying on textbooks. These faculties had generally stopped buying textbooks and had designed their budgets around photocopying. The other faculties issued textbooks to the students either to take home or collected them at the end of lessons. In the latter case, the use of textbooks was occasionally combined with worksheets that had been developed over a number of years. One faculty developed thematic booklets with simplified language in response to the literacy difficulties of their students. One teacher mentioned obtaining external resources, such as charts and tables from post offices and train stations. The preparation of these resources and the organisation of thematic units were sometimes undertaken by groups of teachers. These consultations took a great deal of time, and teachers often became reluctant to work co-operatively as a result. Faculty money was also a problem in acquiring additional resources. With regard to technology, teachers complained about the lack of available computers, lack of training, and the time constraints involved in organising a technology-based lesson. This is consistent with the findings of other researchers in the area (Rogerson, 1990; Usiskin, 1991).

Conclusions

This study has shown that, contrary to belief (Williams, 1977), teaching mathematics thematically is not easy. It is rather, as Henderson and Landesman (1995) stated, a difficult pedagogical task due to its complexity and lack of structure. This seems to be particularly true, as in the case of the current study, when low-achieving students in mathematics are the target group.

Although teachers' responses showed a general appreciation for the humanistic goals of teaching thematically, they disagreed with the mandatory teaching requirements because of pressures originating from a range of instructional, curricula and organisational factors that affected their implementation of a thematic approach to teaching mathematics in secondary schools. In general, it seemed that despite the mandatory requirement to teach the course thematically, teachers typically utilised more traditional methods. That is, they taught via topics and tended to focus on procedural approaches based on rules and formula.

The overarching aim of the study was to explore secondary mathematics teachers' beliefs and practices about the teaching and learning of mathematics thematically. The findings reported here provide insights into the barriers and challenges teachers face teaching mathematics, and in

particular, teaching mathematics thematically. A limitation of the study lies in the self-report nature of teachers' beliefs and practices which cannot be immediately verified. Therefore, it is recommended that further research should be conducted to compare and supplement this information through observational methods. Such research would shed light on how teachers are actually enacting the thematic approach in their classrooms from a naturalistic perspective. Finally, the limited size of the sample in the interview component of the study as compared to the total population of teachers teaching the Standard course in New South Wales does not allow for broad generalisations of the results and conclusions of the study.

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Appendix[1]

Sample Items of the Questionnaire

For each questionnaire item seven choices of response were presented on a scale varying in their degree of agreement to the item. Participants were asked their responses to items such as:

- Teaching in **THEMES** should only be taught in the **Standard Course**
- There is a "best way" to do a mathematics problem
- Trial and error should not be allowed in solving a mathematics problem
- Teaching in **THEMES** should be made optional and not compulsory
- The applications of a mathematical result are more important than its proof
- Teachers should teach exact procedures for solving word problems
- Applications problems are best left to the end of the topic in mathematics
- Teaching in **THEMES** is only for low achievers

Sample Questions from the Interview

The interview guide included open ended questions such as:

- What are the advantages of teaching mathematics in themes?
- Do you think teaching themes to Standard students can be difficult? Why?
- Do you think that parents/colleagues and/or school administrators prefer teaching through topics rather than in themes?

[1] Full copies of the instruments are available from the authors.

Do you think that:

- The Course outcomes of the themes were closely matched by the last School Certificate Test?
- The Course outcomes of the themes are clear and reasonable to implement and follow?
- Assessing and reporting students' performance in learning by themes should be based on applications of mathematics rather than mostly on mathematics content?
- Should the teaching of mathematics in themes be optional rather than compulsory?
- Is the balance of themes and topics in the Standard Course appropriate?
- What difficulties do you have in preparing lessons for teaching mathematics in themes?
- What textbooks do your Standard students use in class?
- What type of technology do you have available in your school for teaching themes in the Standard Course?